Commercial Used Fuel Storage

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Used fuel is stored in stainless steel racks in a wet storage pool after being discharged from a nuclear reactor. The water in the wet storage pool provides cooling and radiation shielding for the fuel assemblies. After the fuel has cooled sufficiently, it is transferred to a dry cask storage system. This transfer typically occurs after approximately 10 years of cooling but can occur as early as 3 years depending on the design of the dry cask storage system.

Nuclear power plants were originally designed with a limited amount of wet storage capacity for used fuel. When it became apparent that the Department of Energy would not be removing fuel on schedule, the nuclear power plants began changing the design of the racks in the wet storage pools to increase the capacity by moving the used fuel assemblies closer together. Only 1 or 2 plants in the US have sufficient capacity in their wet storage pools to operate until the end of their renewed license without having to utilize dry cask storage.

Utilities consider long term operational objectives when coordinating the management of wet storage pools and dry cask storage systems. As an example, a utility may choose to load a mixture of longer and shorter cooled fuel in a dry cask storage system in order to reserve some of the longer cooled fuel for future dry cask loading campaigns where it can be used to help reduce occupational exposure during loading. In addition, utilities must schedule dry cask loading campaigns between refueling outages and when the appropriate personnel and facilities are available for an extended period of time. It typically takes 5-7 days, working around the clock, to prepare, load, and deploy a single dry cask storage system. This time estimate does not include the mobilization and demobilization efforts that must occur for a loading campaign. During a typical campaign, 3 to 10 casks may be loaded.

There are three characteristics associated with used fuel that may significantly influence the design of wet storage pools, dry cask storage systems, and transportation systems. These characteristics are: reactivity (the potential to sustain a chain reaction), thermal intensity (heat), and radiation intensity. Table 1, below, shows how these characteristics change with increasing burnup (irradiation time in the reactor) and increased cooling time following removal from the reactor. Table 1 also indicates the relative importance of these characteristics in storage and transportation system design.

Table 1: Consideration of Used Fuel Characteristics in Design of Storage and Transport Systems

Used Fuel Characteristic	How the characteristic changes with increasing		Relative importance as a design consideration for		
	Burnup	Cooling Time	Pools	Storage Casks	Transport Casks
Reactivity	Decreases	Slightly decreases	High	High	High
Thermal	Increases	Decreases	Medium	High	High
Radiation	Increases	Decreases	Low	Medium	High